REMARKS

Applicant submits various new claims and newly identified references for the Examiner's consideration prior to examination. Upon entry of this amendment, claims 1-81 are pending in the application, of which claims 1, 12, 19, 23, 39, 54, 65, and 74 are independent.

PARTICULAR REFERENCES OF INTEREST

The following comments regarding several references of record are provided for the Examiner's consideration. However, the Examiner is encouraged to review all of the references cited in applicant's Information Disclosure Statements and to form his own opinion regarding which references he considers to be pertinent to the pending claims. The comments point out some, but certainly not all, of the distinctions between the pending claims and the following references:

- Baumberger, "A Single-Chip Image Rejecting Receiver for the 2.44 GHz Band Using Commercial GaAs-MESFET-Technology";
- Crols *et al.*, "A Single-Chip 900 MHz CMOS Receiver Front-End with a High Performance low-IF Topology";
- Fleek *et al.*, U.S. Patent 6,875,212;
- Kuhn, "Design of Integrated, Low Power, Radio Receivers in BiCMOS Technologies";
- Okanobu *et al.*, "Advanced Low-Voltage Single-Chip Radio IC";
- Rotzoll, U.S. Patent 5,737,035; and
- Voorman, U.S. Patent 4,914,408.

Crols *et al.* is dated December 1995 and was unlikely to have become effective as a "printed publication" much earlier than a month before that date. Kuhn is also dated December 1995, but it appears that the reference was not catalogued and made publicly available until March 1996. Applicant believes that each of the pending claims is

allowable over <u>all</u> references of record, including Crols *et al.* and Kuhn. If necessary to obtain prompt allowance of particular claims, however, applicant is prepared to submit an appropriate declaration under Rule 131, with accompanying exhibits, to establish invention of the claimed subject matter prior to the effective dates of those references.

"Near-Baseband Passband" Limitations of All Claims

All pending independent claims call for tuning of a signal directly to a "near-baseband passband" with a particularly advantageous spacing from DC. The passband and its spacing are variously claimed as follows:

> [the] local oscillator signal has a frequency that is . . . is selected to frequency translate the signal of interest to within a near-baseband passband defined with reference to a lower frequency F1 and an upper frequency F2, wherein F1=F2-F1, whereby problems associated with 1/f noise, DC offsets, and self-mixing products are avoided or substantially diminished **[claim 1]**

> [a]pparatus for tuning . . . a signal of interest having a predetermined maximum bandwidth . . . wherein the frequency-translated signal of interest falls within a near-baseband passband defined with reference to a lower frequency F1 and an upper frequency F2, wherein F1=F2-F1 **[claim 12]**

> [a]pparatus for tuning . . . a signal of interest having a predetermined maximum bandwidth . . . wherein the frequency-translated signal of interest falls within a near-baseband passband spaced from DC by a frequency offset of at least about the maximum bandwidth of the signal of interest **[claim 19]**

> frequency [translating] to a near-baseband passband an upper high frequency spectrum of interest from above the frequency of [a] local oscillator signal and a lower high frequency spectrum of interest from below the frequency of the local oscillator signal, the near-baseband passband [being] spaced from DC by at least about the passband's width **[claims 23, 39]**

> tuning a signal from a channelized spectrum[,] . . . passband filtering the signal to define a near-baseband passband that is (1) sized to fit one channel and (2) spaced from DC by at least about the passband's width **[claim 54]**

> defining a near-baseband passband whose lower edge is spaced from DC by at least about the maximum bandwidth of the signal of interest by passband filtering **[claims 65, 74]**.[1]

As mentioned in applicant's amended "Background of the Invention" section, Baumberger discloses the use of a 150-MHz wide intermediate frequency range (from 130 to 280 MHz) in a receiver having a tuning range on the order of 500 MHz. With regard to claim 54, however, applicant does not believe that the reference teaches or suggests sizing a near-baseband passband to fit one channel. Indeed, the reference does not appear to refer to any channel size, and the "cordless telephones, radio pagers, data modems, and satellite terminals (*e.g.*, for GPS)" it mentions (P1244/C1) employ channels that were typically much narrower than 150 MHz.

In the amended "Background of the Invention" section, applicant has also directed attention to Fleek *et al.*, which discloses a receiver that converts to a non-zero intermediate frequency. However, applicant submits that the reference cannot be considered to teach or suggest any "near-baseband passband" because the receiver it purports to disclose appears to be responsive to intermediate-frequency signals all the way down to DC. A passband cannot be "near" baseband if it actually includes baseband. In addition, Fleek *et al.* does not teach or suggest applicant's advantageous passband spacing from DC, as variously claimed. Thus, as the amended "Background" section mentions, the receiver of Fleek *et al.* remains vulnerable to low-frequency problems associated with direct-conversion receivers, including 1/f noise, time-varying DC offsets, and products of self-mixing of strong signals.

Kuhn, in Section 4.2.4 ("Designs with Ultra-Low IFs"), refers to an

> ultra-low IF architecture [that] is illustrated in Figure 4.10, where the RF frequency f_{RF} is related to the LO frequency f_{LO} through the channel bandwidth B:
>
> $$f_{LO} = f_{RF} + K\ B$$
>
> Assuming that the constant K is selected as $K = ½$, the RF signal will be down converted to an IF frequency of $f_{IF} = B/2$ and channel selectivity can be provided with a lowpass filter with cutoff frequency $f_c = B$.

[1]Emphasis added, as with all quotations from applicant's claims or specification.

The reference goes on to mention the possibility of K = ¼. The reference's Figure 4.10 illustrates a mixer followed by a lowpass filter, see P107.

Like Fleek *et al.*, the Kuhn reference's "ultra-low IF architecture" appears to be responsive to intermediate-frequency signals all the way down to DC, precluding it from teaching or suggesting a "near-baseband passband." In addition, the reference only cites K values of ¼ and ½, and thus fails to realize the benefit of applicant's advantageous spacing from DC, as variously recited in all of the independent claims.

Okanobu *et al.* purports to disclose a receiver with an AM IF at 55 kHz. The reference refers an "AM band pass filter . . . [that] consists of three 2nd order biquad 55kHz band pass filters shown at Fig. 12," for which "adjacent channel suppression 10kHz away from center frequency is 35 dB." See Fig. 13, which indicates a 3 dB passband width of about 6 kHz, as further indicated by the "active filter circuits having a 10-20 Q factor," (P465/C1). Rotzoll refers to a "present state-of-the-art TV tuner configuration" (C5/L26) with a "SAW (surface acoustic wave) filter 316, which limits the bandwidth of the signal to only one (1) channel (6 MHz for NTSC standard)" (C5/L31-33). See FIG. 3, where filter 316 is labeled with "40-46 MHz." The input to filter 316 comes from a mixer 308, which

> mixes the output of [a bandpass and image reject notch] filter 312 with the output of a local oscillator, frequency synthesizer 342, which has a frequency chosen to be higher than the desired receiver carrier by 45.75 MHz, Thus, the output of mixer 308 is 45.75 MHz. [C6/L9-13]

In both cases, the filter passband is many times farther from DC than necessary to avoid the low-frequency problems mentioned. Thus, neither reference teaches or suggests a "near- baseband passband" as variously claimed by applicant. Further, with regard to claims 1, 12, the filter passbands of Okanobu and Rotzoll are not even remotely capable of being "defined with reference to a lower frequency F1 and an upper frequency F2, wherein F1=F2-F1."

Voorman discusses asymmetric polyphase filters that it claims "can be easily integrated and are particularly advantageous when used in, for example quadrature receivers for the suppression of mirror frequencies and/or in demodulators." The reference illustrates two examples of passbands with upper edges that are positioned at

perhaps 1.6 times (see Fig. 1I) and 2.5 times (see Fig. 2H) the frequency of their respective lower edges. Neither in those examples nor elsewhere does Voorman teach or suggest any near-baseband passband defined with reference to a lower frequency F1 and an upper frequency F2, where the upper frequency F2 is twice the lower frequency (*i.e.*, F1=F2-F1), as in claims 1, 12. Nor does applicant believe that the reference teaches or suggests sizing the passband to fit one channel and spacing it from DC by at least about the passband's width, as in claim 54.

Indeed, applicant believes that none of the references discussed above or otherwise of record, including Crols *et al.*, teaches or suggests the near-baseband passband specified as in claim 54. Applicant further believes that Fleek, Kuhn, Okanobu *et al.*, and Rotzoll all fail to teach or suggest the near-baseband passband specified as in any of the pending claims. As discussed below, applicant also believes that Baumberger, Crols *et al.*, and Voorman all fail to teach or suggest the various "channelized spectrum" limitations of claims 1, 12, 19, 23, 39, 65, 74.

"Channelized Spectrum" Limitations of Claims 1, 12, 19, 23, 39, 65, 74

Independent claims 1, 12, 19, 23, 39, 65, 74 further call for tuning a signal from a channelized spectrum. A signal of interest is mixed with a local oscillator signal. In claims 1, 12, 19, 65, 74, the channelized spectrum has a predetermined channel spacing and the local oscillator signal is related to an integer multiple of that channel spacing. Claims 23, 39 do not specify any predetermined channel spacing, but instead call for the local oscillator producing the local oscillator signal to be coarse-tunable across the channelized spectrum with a step size S.

Baumberger, at P1248, subsection B ("Conversion Properties"), refers to a "VCO tuning range," see Fig. 8. The reference also refers to a prescaler with "two stages, operating at 0.6 and 0.3 GHz input frequencies," see Fig. 3. As discussed above, Voorman suggests that its asymmetric polyphase filters "can be easily integrated and are particularly advantageous when used in, for example quadrature receivers for the suppression of mirror frequencies and/or in demodulators."

Crols *et al.* discusses the low-IF receiver topology, stating that "[i]t uses an IF of a few hundred kHz and is therefore not sensitive to parasitic baseband signals like dc [*sic.*, DC] offset voltages and self-mixing products" (see P1483/C2, *i.e.*, page 1483, column 2). The Examiner is referred initially to Figs. 5, 7(c) and 8 of that reference, and to the text at P1486/C2, which states that "the IF may be situated at low frequencies (about one to two times the bandwidth of the wanted signal)." Crols *et al.* refers to a "quadrature downconverter [that] in combination with an LNA and a synthesizer can form the complete and fully integrated analog low-IF receiver front-end," see P1483/C2.

However, applicant believes that neither Baumberger, Crols *et al.*, nor Voorman teaches or suggests any relationship between a local oscillator frequency and frequencies of RF channels within a channelized spectrum, particularly not with relation to an integer multiple of any channel spacing, as in claims 1, 12, 19, 65, 74. In addition, those references do not teach or suggest any "one-half of a channel spacing" displacement from such an integer multiple, as in claims 1, 12, 74.

Fleek *et al.*, in one paragraph (C10/L64-C11/L2) and in conjunction with discussion of a local oscillator frequency as "2.4 GHz + 2 MHz" (see FIG. 18), mentions "nearby IF channels" and "frequency hopping . . . performed between nearby IF bands, each of which is 1 MHz wide." However, the reference does not teach or suggest the local oscillator frequency having any "one-half of a channel spacing" displacement from an integer multiple of a channel spacing, as in claims 1, 12, 74.

As discussed above, Okanobu *et al.* purports to disclose a receiver with an AM IF at 55 kHz. The reference does not teach or suggest that the receiver's local oscillator frequency is an integer multiple of the channel spacing, as in claims 19, 65. Indeed, the local oscillator frequency needed to translate an AM broadcast signal centered at an integer multiple of 10 kHz to the 55 kHz IF frequency could not be an integer multiple of a 10 kHz AM broadcast channel spacing. The reference also does not teach or suggest the use of a local oscillator that is coarse-tunable across a channelized spectrum with a step size S, as in claims 23, 39. Rather, it illustrates a continuously-tuned tank circuit, see Figs. 6, 17, 21.

Rotzoll points out (C8/L40-42) that "[television] [c]hannels 2-13 in the VHF band extend from 54 Megahertz to 216 MHz and channels 14-83 in the UHF band extend from 410 MHz to 890 MHz." The "present state-of-the-art TV tuner configuration" of its Fig. 3 includes a frequency synthesizer 342 labeled in the figure with "100-850MHz." However, applicant does not believe that Rotzoll teaches or suggests relating a local oscillator frequency to an integer multiple of any channel spacing, as in claims 1, 12, 19, 65, 74. Indeed, NTSC television signals do not have any single, uniform spacing between channels that could be employed as a point of reference for such an "integer multiple."[2]

CONCLUSION

In view of the distinctions pointed out above and additional distinctions, *e.g.*, regarding the various "repeated tuning for multiple LO frequencies" limitations of independent claims 23, 39, 54 and other limitations of claims that depend from the independent claims discussed, applicant respectfully requests allowance of all pending claims. Please feel free to telephone the undersigned if it would in any way advance prosecution of this application.

Respectfully submitted,

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[2]The frequencies for NTSC channels 2-83, as specified by 47 C.F.R. § 73.603, variously have spacings of 6.0 MHz, 10 MHz, 92 MHz, and 260 MHz between the center frequencies of adjacent channels.